Economic Geography of Russia

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Abstract

In this chapter we review economic, geographical and historical literature on the spatial allocation of the economic activity in Russia. We distinguish three main factors which shaped Russian economic geography, namely physical geography, policy of the state and historical circumstances. We discuss how these factors affected the location of population and economic activity from the 16th century to the present time. We consider historical trends in population geography, industrial and migration policy during the Imperial and Soviet eras, and the changes in spatial economy of Russia during the post-Soviet period.

1. Introduction

This chapter deals with Russian economic geography and how it evolved from the time of formation of Russian centralized state to the present day. We review economic, geographical and historical literature on the subject and discuss factors which affect the spatial allocation of population and economic activity in Russia. We distinguish three such factors. The first one is physical geography: location, climate, size, and other features of the country's territorial endowment. The second factor is the state policy of regional development, which was shaped by the trade-off between the desire for the frontier development and the costs associated with it. The third factor is national history, and the circumstances of past regional development.

Russia is unique in climate, size, and location. Russian Federation is the largest country in the world, taking up 11.5% of the world's landmass. Yet the majority of this vast land area is virtually

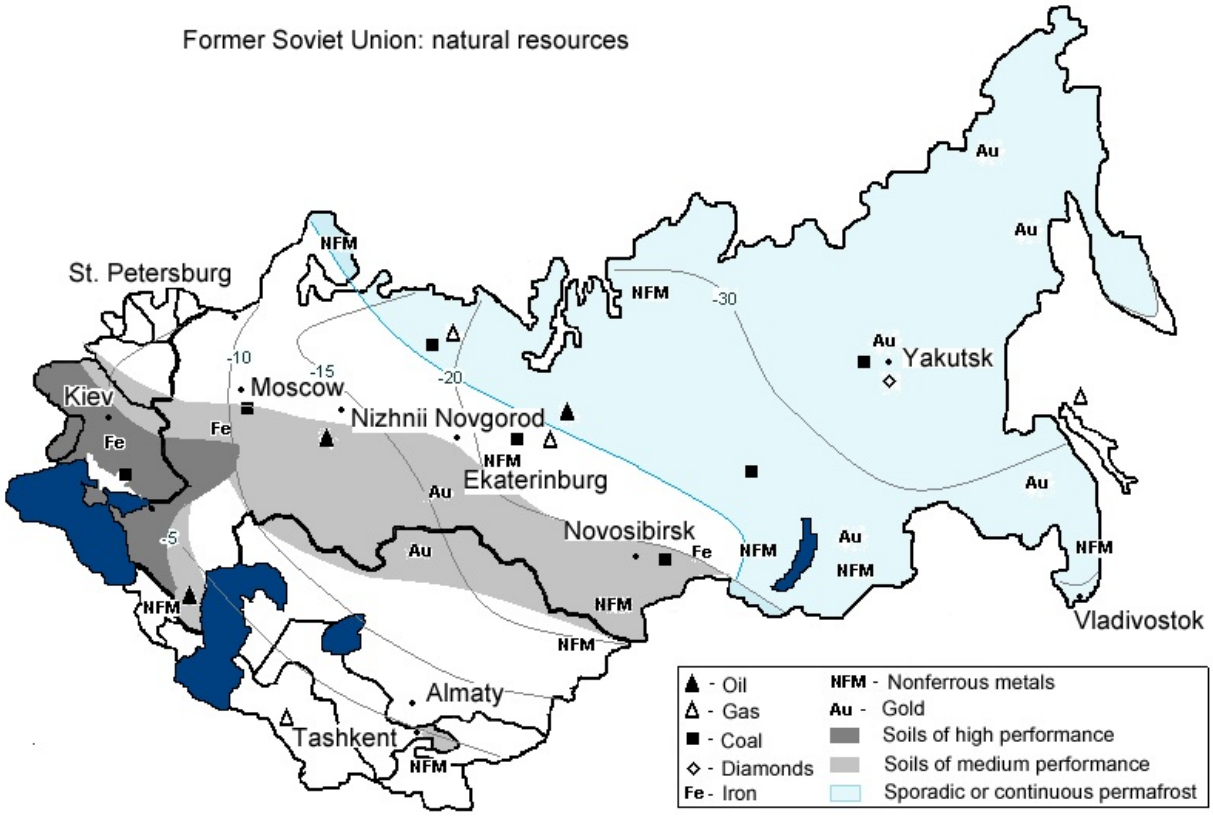
uninhabited. 65% of Russian territory is exposed to continuous or sporadic permafrost. Average January temperature in Moscow is -10°C,[1] but over 90% of Russia's territory is even colder (see Figure 1). Accessibility is another problem. On the northern part of the Eurasian landmass most of the rivers flow from south to north. There are no cheap transcontinental water transportation routes from Europe to Asia, costly land transport is practically the only option. Most of Russia's territory is not only cold, but also remote from the world markets and from the main population centers in Russia itself.

Physical geography presents natural constraints to the distribution of economic activity over the territory. Given such climate and land endowment, it is not surprising that Russian population is concentrated in the areas with relatively favorable natural conditions. Figure 2 shows population density. The eastern part of the country and a narrow strip along its southern border to the east of the Ural mountains, which together constitute less than 20% of its total land endowment, host the majority of population. But even there population density is generally low relative to international standards. It is an unusual combination: Russia's population is quite concentrated, if we consider all of its vast territory; at the same time it is still sparse compared to the majority of other countries. This sparsity of population and economic activity on the huge territory is one of the key features of Russian economic geography.

Physical geography is also an important driver of the spatial evolution of Russian economy. Natural resources compose a bulk of the value of the Russian frontier – Siberia and the Far East. The desire to exploit them caused spatial expansion of the Russian Empire and has been always an essential determinant of state policy. Figure 1 shows the location of major natural resources and January isotherms on the territory of the former Soviet Union. It is apparent that most of highly valuable resources: not only fossil fuels, diamonds, and lucrative deposits of various nonferrous metals, but timber and furs (a resource of major importance in the imperial and pre-imperial times), are located far from where people live, in the regions with hostile environment, far away from the major communication routes.

[1] It is a third coldest capital in the world, after Ulaan-Bataar (Mongolia) and Astana (Kazakhstan).

Exploitation of these resources is costly. The state – either the Russian Empire, or the Soviet Union, or modern Russian Federation – faced the same trade-off at all the times. On one hand, there is the desire to reap benefits of this vast territory; on the other hand, there are the enormous economic costs of development in this hostile natural environment.



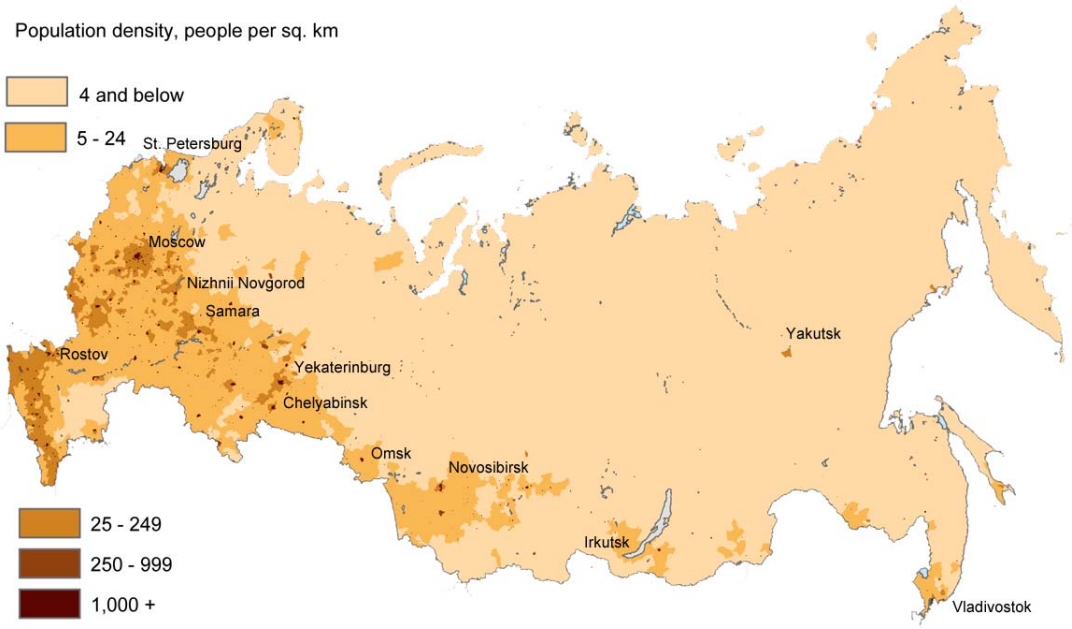
Soils classification is from Inherent Land Quality Assessment project, USDA, Natural Resources Conservation center. Areas are shown schematically.

Figure 1: Natural resources, climate, and land quality in the former USSR.

Over the centuries this cost-benefit trade-off of the frontier development was resolved differently. Yet the common feature is that the state has always been a major decision-maker with limited market mechanisms of allocation of resources. The Russian Empire through most of its history tried to strengthen military presence in the East and South-East. The Soviet Union resettled population and implemented massive investment programs into Siberian and Far East regions. Both approaches have left a legacy in the economic geography of Russia that we observe today. The rest of the article

discusses what we know from the works of historians, economists, and geographers of how physical geography, history and policy affected the spatial economy of Russia.

The chapter is organized as follows. Section 2 outlines the evolution of population density and migration policies in the Russian Empire. Then, section 3 discusses Soviet industrial policy and its impact on the distribution of economic activities across regions. Section 4 focuses on cities and urbanization history. Section 5 reviews the evidence on the changes in the spatial structure of Russian economy, migration flows, and regional inequality after the break-up of the Soviet Union. Section 6 concludes.



Data from Gridded Population of the World project, Columbia University, 2005. Resolution 2.5'×2.5'.

Figure 2: Population density in Russian Federation, 2000.

1. Historical population geography of Russia

The main theme in the spatial evolution of Russia is that it has been always a frontier state, and its history is mainly a story of territorial expansion. From the 16th century to the late 19th century the Russian Empire was incorporating new territories. Largest territorial acquisitions were to the east

and to the south of the historical center: Moscow. The changes in the spatial allocation of population followed the same south-eastern vector.

Population history: an overview

By the early 16th century Moscow princedom established its leadership as a new center of the country that unified all Russian princedoms. At that time, Russians occupied only the north-west of the modern territory of the country, to the north of the Oka river and to the west of the Urals mountains. In 1550 total population did not exceed 6.5 million, population density was extremely low (see (Moon 1997)), only about 2.3 persons per square kilometer. Poor soils and weak agricultural techniques limited population growth on this territory, while much richer soils of black earth regions to the south of Moscow remained sparsely populated because of the permanent threat of nomad raids.

Over the next four centuries, the Russian Empire dramatically expanded in the western, southern and eastern directions. In the south and south-east, Russia gradually defeated various nomadic khanates and conquered a wide steppe region of Black earth lands, Middle and Low Volga, Don and North Caucasus, known as "wild field" (*dikoe pole*) before the annexation. The Urals, Siberia and the Far East - huge and very sparsely populated territories – were gained in the next waves of imperial expansions. Common among all these territories was low density of indigenous population. It was, essentially, a wild frontier. Centuries later it would become an integral part of the Russian Federation's economic core that (Bradshaw and Prendergrast 2005) called "a new Russian heartland"[2] Relatively well populated at the moment of annexation were only the new provinces in the West, Transcaucasia, and Central Asia, i.e. roughly the territories which became new independent states after the collapse of the Soviet Union.

Table 1 presents population history of Russia since the first household tax census of 1678 (the first date for which reasonably accurate population figures are available) till the beginning of the 20th century. Figures 3 and 4 give four snapshots of population density throughout the history (we use historical maps because of the administrative borders problem but show density only for provinces which belongs to the modern Russian Federation).

[2] The name originates from the book by Hooson (1964) "A New Soviet Heartland".

In 1678 total population of Russia was about 11.2 million people. Population density was the highest in the center region in the provinces around Moscow. At this time, the Black Earth region was already colonized for more than a century, but still underpopulated relative to the Centre, because of an active threat of nomad raids from the Khanate of Crimea, that remained present till the late 17th century. Rapid population growth in the Black Earth belt started only in the 18th century. Middle Volga belt saw a significant increase in population in 19th century. Siberia, despite all the abundant agricultural land in its southern parts, was practically empty until the mid-19th century. Only at the end of the 19th century the wave of population density increase reached southern Urals and Siberia - this was three centuries after these territories were annexed by the Russian Empire.

	People per square kilometer				
Region	1678	1719	1795	1858	1897
Centre	4,82	5,65	8,65	22,24	29,48
North-West	1,42	1,82	3,98	13,40	23,30
Black earth	2,91	4,66	9,93	30,29	43,01
East and South-east	0,25	0,52	2,20	10,22	16,18
North and North-east	0,27	0,30	0,75	3,06	4,35
Siberia	0,005	0,01	0,05	0,22	0,46
Empire total (mln)	11.2	15.6	37.4	74.5	128.9

Sources: 1678 and 1719: (Vodarskii 1977), 1795, 1858 and 1897: calculated in the framework of *Electronic Depository of Russian Historical Statistics* project[3] from original sources: (Kabuzan 1971) (1795), (Bushen 1863) (1858), (Trojnitskii 1905) (1897).
Centre region: Moscow, Vladimir, Kaluga, Yaroslavl, Kostroma, Nizhnii Novgorod, Tver', Smolensk provinces.
North-West: S-Petersburg, Novgorod, Pskov provinces.
Black Earth: Voronezh, Ryazan', Kursk, Tambov, Orel, Tula provinces.
East and South east: Kazan', Penza, Simbirsk, Saratov, Samara, Astrakhan', Orenburg, Ufa provinces.
North and North-east: Olonetz, Vologda, Archangelsk, Vyatka, Perm' provinces.
Siberia: Tobol'sk, Tomsk, Irkutsk, Enisejsk, Zabajkal'skaya, Amur, Kamchatka, Primorskaya, Sakhalin, Yakutsk provinces.

Table 1: Population density in the Russian Empire

The general direction of population diffusion toward the south-east is well explained by the economic incentives in a primarily agrarian Russian economy. Accessible regions with good climate and fertile lands saw faster population growth. However, the speed of migration was very slow.

[3]http://www.nes.ru/en/science/russiastats

Huge distances and poor transportation routes provide one explanation for sluggish population expansion over the new territories, but the most important reason was the institutional factor: the prevalence of serfdom and restrictions on migration that existed in the Russian Empire up until the turn of the 20th century.

Migration policy in the Russian Empire

Political and institutional framework of Russian serfdom prevented free movement of population. By the time of emancipation reform in 1861, more than a third of the population were serfs, i.e. private property of the gentry. Another third of the population were state serfs who were bound to their settlements and the land. Serfs had no legal rights to act on their own, and in particular to choose place of living without consent of their lords. But not only serfs were restricted in their geographical mobility. Other social groups, including gentry (who had no right to leave the country freely, for example) faced various legal restrictions on where they could live (see, for example, (Ivanova and Zheltova 2010)).

Table 2 reports the levels of internal migration inflow into frontier recipient regions in late 17th early 20th centuries. Although these migration flows might seem significant in absolute numbers, in relative terms they never exceeded 0.2% of the total population per average year during any period. Before the emancipation of serfs in 1861 this number was below 0.1%.

	Migration inflow, thousand people					
Region	1678-1740	1740-1782	1782-1858	1870-1896	1897-1915	1678-1915
Black Earth	260	370	-	-	-	630
Siberia and Kazakhstan	90	-	517	926	3520	5053
'Novorosiya' (southern Ukraine)	-	135	1510	1045	333	3023
Volga and Urals	-	270	968	358	80	1676
North Caucasus	-	-	565	1687	296	2448
Total	350	775	3560	4016	4229	12830

Source: (Mironov 1999). Regional classification of provinces: see notes to table 1.

Table 2: Migration in the Russian Empire

The tsarist government tried to regulate migration flows closely under serfdom. Migration under state patronage typically proceeded in orderly stages and was often involuntary. First, the government established a line of fortresses and sent militarized settlers to defend them against nomads. Once the territory behind the line would become secure, the state either granted internal land to the gentry who settled serfs into their new estates, or encouraged state serfs to resettle into new regions. In general, the policy of the state was to provide minimal military presence to stake a claim for the territory. Purely voluntary migration was mainly illegal. Such migrants were serf escapees fleeing from the government who settled behind the fortress lines.

The purpose of the Russian government in restricting migration was twofold. First, it aimed to keep its taxation base under control. Migration to the new territories posed a threat, since effective authority of the government was much weaker there. Second, the government wanted to secure cheap labor for the gentry's estates in the historical core of the country. Mass peasant emigration could have made labor relatively more scare and therefore expensive. This would have undermined the political support of the state by the gentry. According to the famous hypothesis by (Domar 1970), the serfdom system in Russia was introduced in the late 16th century as a reaction to the sharp decrease in labor-to-land ratio after the annexation of the new territories in the east and the depopulation in the center caused by the series of wars and by the domestic policy of Ivan the Terrible. The desire to keep labor cheap was so entrenched, that various migration restrictions survived even after the serfs emancipation.

Other reasons for the lack of population mobility were high transportation costs and poor access to credit. In a poor country it was difficult for many to finance the move. The history of the late Russian Empire after 1896, when free resettlement into Siberia was introduced, illustrates the scale of the problem. When the construction of Trans-Siberian railroad opened relatively cheap access to the Asian part of the country, migration flow to Siberia doubled. When Stolypin reform of 1906 eased peasants liquidity constraints, granting them the right to withdraw from the commune and to sell one's share of land, migration further intensified. (Chernina, Dower and Markevich 2010) estimate that Stolypin titling reform can explain at least 15% of all migration intensity thereafter.

The last years of the empire between Stolypin reform and the October revolution, is a unique period in Russian history. It is essentially the only time in history when geographical mobility of

population was not hindered by the state. The result of this freedom was the wave of peasant migration to Siberia, the redistribution of labor to the areas where agricultural land was still abundant. The Soviet period was marked by further movement of population and economic activity to the northern and eastern parts of the country. The share of population in Eastern Siberia and Far East relative to the population of the whole Soviet union increased from 3.3% in 1926 to 5.9 % in 1985 (Rybakovskii 1985 p. 57). Yet these changes were no longer dictated by market-based incentives of independent agents, but by the ideology of the Soviet state and the system of central planning as well as massive evacuation of population from the European part of the country to the East caused by the shock of the Second World War.

2. Industrial policy in the USSR

Seven decades of central planning in the Soviet Union produced the dramatic changes in the spatial structure of Russian economy. (Hill and Gaddy 2003) presents a detailed account of how atypical Russia's economic geography is: an unprecedented share of population is located in severe climatic environments, isolated by the distance from the major world markets. The Soviet government put enormous resources into moving millions of people to Siberia, the North, and the Far East and developing permanent settlements there. During Stalin's industrialization, GULAG prisoners were used to overcome the scarcity of labor in the remote areas. Later, a system of pay incentives was used to attract voluntary migrants there. Overall, the result of the 70 years of the Soviet rule was a major shift of population, infrastructure, and capital to the eastern parts of the country. In this section we discuss Soviet regional policy, its ideological roots, implementation and consequences.

Soviet location principles and practice

General principles of resource allocation in the USSR provided ideological foundations for Soviet regional policy. (Rodgers 1974) offers a very broad classification of these principles. The first group of principles – “growth-oriented” – were to ensure what was viewed as efficient exploitation of natural resources. In the Soviet planning environment this essentially implied locating manufacturing facilities to minimize transportation costs. Plants had to be either near primary resources or near consumers. The second group of principles - "equality-oriented" - dictated that economic growth has to be geographically balanced. Capital investments had to go to the relatively underdeveloped regions. Finally, the third group of principles claimed the priority of strategic

considerations: manufacturing facilities had to be located to maximize the country's defense potential.

These principles had the following implications for the regional structure of the Soviet economy. The principle of exploiting natural resources with the minimal transportation costs alone dictated the shift of the manufacturing facilities toward the east, to Siberia – this is where the resources are. Many researchers in the 1960s-1980s wrote that this principle did not violate economic rationality and should not have resulted in additional distortions, because, after all, it strives to minimize costs (see, for example (Dyker 1983)). However, in the market economy an agent deciding on location looks at a multitude of factors apart from transportation costs. He takes into account factor markets (cost of labor and intermediate goods), technological spillovers and infrastructure, environment and differentials in the costs of production. Ignoring these factors would hardly leave any hope that Soviet investment decisions would be made efficiently. Moreover, in the command economy the planners did not observe either the true economic costs of transportation or market prices for most goods. So, it is reasonable to expect that implementing this principle would push industrial investment decisions toward the eastern parts of the country more than the economic efficiency would have demanded.

The second principle called for investments into the lagging regions and for equalization of the regional level of economic development. Beneficiaries of this principle were the republics of Central Asia and other peripheral Soviet regions. Within the borders of the modern Russian Federation the beneficiary regions were ethnic republics, Siberia and the Far East. This was yet another reason to overinvest into the eastern parts of the country.

The third principle favored locating industry in the interior of the country at the expense of the regions closer to the border, vulnerable in the case of land war. The importance of this principle was emphasized by the Second World War experience, when the Soviet government had to evacuate up to twenty million people from the European to the Asian part of the country, mainly to the Urals and its Siberia. This principle also favored the eastern shift in the location of strategically important manufacturing facilities.

In sum, Soviet location principles should have produced a spatial allocation of economic activity in the USSR that is skewed to the east compared to what would happen without the influence of the

socialist state. The question is, to what extent were these principles indeed followed? (Dienes 1972) calculates value added and productivity of capital and labor by Soviet regions. He shows that investments decisions were indeed biased toward peripheral regions while productivity there was lower than in historical center. He points out that development of the sparsely populated East comes with a very high cost of labor. In the 1960s, i.e. after the system of GULAG forced labor was abolished, the state faced substantial outmigration from the Urals and Western Siberia and had to offer a substantial wage premium to attract labor migrants there. At the same time, substantial capital investments went into the Soviet republics in Central Asia, where labor was relatively abundant, but productivity of capital was below average. Dienes concludes that the decision to invest into underdeveloped regions was not driven by profit maximization (not even by the profit calculated in the Soviet system of prices), but followed the ideological line toward regional equality.

(Rodgers 1974) documents shifts in industrial employment in the USSR in 1940-1965 with clearly visible eastern trend. He also finds evidence of steadily decreasing regional inequality. In Tables 5 and 6 we calculate oblast-level indices of industrial production in RSFSR y decades. Soviet regional priorities are clearly visible. The southern Siberia enjoyed the fastest industrial growth up to the end of 1920s – a continuation of the migration trend that started in the Russian Empire after Stolypin reform. Next, in the 1930s, the lead is taken by the extreme peripheries: the Far East and Murmansk oblast in the north-west. The decade of 1940s includes WWII and explosive growth of the Urals and Siberia because of wartime evacuation. Somewhat weaker effect of the post-war restoration is visible in the 1950s in the western parts of the Soviet Union. Starting from 1960s onwards, the trend becomes stable: in all these years the gain in industrial production is biggest in the regions east of the Urals.

Population migration had followed eastern industrial investments pattern, in general. However, after Stalin's death and a shift to more liberal labor policy the Soviet government periodically faced labor shortages and even outmigration from regions of mass investments. In particular, the Urals and West Siberia saw intensive outmigration flows in the 1960s and the first half of 1970s, because living standards there were worse than in the European part of the country. With the help of investments into infrastructure and wage premia the government managed to overcome this tendency in the late 1970s (Rybakovskii 1988, pp. 58-64).

The distortions in the spatial structure of the economy and the allocation of population by the end of the Soviet era were quite large. (Mikhailova 2004) constructed a counterfactual spatial allocation that would result in Russia without the influence of Soviet planning. To do so, she looked at Canadian data for the 20th century and estimated a dynamic relationship between the regional shares of population and industry and a variety of regional characteristics. Then, this estimated relationship was projected onto the Russian data starting from 1910, i.e. before the October revolution. Thus, she predicted spatial allocation population and industry that would result if Russia evolved like Canada, but controlling for Russian regional natural resource endowments, geographical location, infrastructure, and history.

(Mikhailova 2004) estimates that at least 14 million people in Russian Siberia and the Far East (or 35% of their population) would not be there if not for the Soviet policies. Had Russia been a market economy, we would still have seen some migration to the east, a continuation of the trend that started in the late 19th early 20th century. However, this migration inflow would have been much smaller than what the Soviet system had produced.

The legacy of the USSR is not simply a shift of productive resources into the extreme climatic conditions, but also a decrease in the spatial concentration of population. As people moved to the east, they were spreading out across the territory, moving away from the world markets and the traditional historical "core" of the country. At the same time, through the 20th century spatial distribution of productive resources in other countries was becoming more and more concentrated, closer to major ports and trade routes.

Spatial concentration

In this section we discuss whether Russian population and industry are more or less concentrated than in other countries. (Campante and Do 2009) propose a set of centered indices of spatial concentration. The advantage of their indices is that unlike traditional ones (spatial Gini, Theil, etc.) they are invariant to the country land area and population size and, therefore, are comparable across countries. Campante and Do calculate these indices for populations of a number of countries. As of year 2000, Russian Federation's population was quite concentrated compared with the benchmark – a uniform distribution of people over the territory. But this is expected in a country where the most

of land is practically uninhabitable. However, Russian population is among the most spatially sparse if compared to other countries.[4]

Not only Russian population is spread out over the territory, but Russian industry also tends to be more equally distributed than in other countries. We calculated (Ellison and Glaeser 1997) dartboard indices for 2-digit SIC industries in Soviet Russia in 1988[5] to compare with the same indices for the USA (calculated by (Rosenthal and Strange 2001)). The benchmark is the population distribution, i.e., if we distribute industrial establishments across regions randomly, with the probability density equal to the regional population share, the expectation of the Ellison-Glaeser index for such an industry would be zero. Table 3 compares spatial concentration of industries in Russia and the USA.

Russian 2-digit SIC industries were on average less geographically concentrated than industries in the USA. This is what we would expect as an effect of the Soviet regional balanced growth policy. Surprisingly, in the Russia there were several industries that for which the calculated concentration indices turned out negative (although very close to zero). They were distributed more equally than random distribution over population would produce, in expectation.

Only a few of the industries were more concentrated than in the US: wood, paper, machinery, primary metal. Also, printing and publishing were more concentrated in Russia - this is not surprising for an autocratic regime. Higher concentration of miscellaneous manufacturing in Russia could be explained by the absence of small businesses that normally produce a variety of custom consumer products.

Consumer goods (apparel, leather, furniture, and also tobacco) were very dispersed in the Soviet times. In market economies, an important driver of concentration in consumer goods are horizontal spillovers related to human capital. Exchange of fashion ideas, technological trends, common labor pool make co-location beneficial for the firms. For the Soviet planning system, fashion was of a secondary importance to achieving regional sufficiency in the supply of consumer goods as a part of

[4] According to Campante and Do (2009), Russia is either 5th or close 2d by sparsity, depending on the weighting scheme. The least concentrated is the USA, but this is primarily because index is centered around capital city - in this case Washington, D.C., which is not the most populous city in the USA.

[5] Data are from the Industrial Census of the Soviet Union, 1988. Indices were calculated for the Russian Soviet Federated Socialist Republic, the same territory that became Russian Federation after the breakup of the USSR.

overall doctrine of balanced regional growth. Instead of clustering, consumer good production was allocated relatively uniformly.

		State-level concentration USA 2000		Oblast-level concentration Russia 1988	
SIC	Definition	index,	rank,	index,	rank,
20	Food and kindred products	0.0035	19	0.0019	13
21	Tobacco manufactures	0.19	1	0.00047	16
22	Textile mill products	0.094	2	0.040	2
23	Apparel and related products	0.012	10	-0.00045	17
24	Lumber and wood products	0.012	9	0.022	7
25	Furniture and fixtures	0.012	8	-0.00092	18
26	Paper and allied products	0.0084	13	0.0238	5
27	Printing, publishing, and allied products	0.0053	15	0.029	4
28	Chemicals and allied products	0.010	11	0.0052	10
29	Petroleum refining and related products	0.036	3	0.022	6
30	Rubber and miscellaneous plastics products	0.0039	17	0.0013	14
31	Leather and leather products	0.015	5	-0.0013	19
32	Stone, clay, glass, and concrete products	0.0035	18	0.0021	12
33	Primary metal products	0.014	7	0.039	3
34	Fabricated metal products	0.0044	16	0.00055	15
35	Machinery, except electrical	0.0017	20	0.0027	11
36	Electrical and electronic machinery, equipment, and supplies	0.0087	12	0.060	1
37	Transportation equipment	0.022	4	-0.0041	20
38	Scientific and professional instruments; photographic and optical goods; watches	0.015	6	0.013	9
39	Miscellaneous manufactured commodities	0.0067	14	0.014	8
	Average	0.0244		0.0135	

Sources: US: (Rosenthal and Strange 2001), Russia: authors' calculations, data from Soviet Industrial Census of 1988.

Table 3: Ellison-Glaeser dartboard indices for US and Russian 2-digit SIC industries.

China provides another interesting comparison. Chinese industries tend to be less geographically concentrated than industries in developed economies due to the legacy of planned system and continuing local protectionism (see (Lu and Tao 2009)). But by comparable measures Chinese industry now is much more concentrated than Russian industry was at the end of the 1990s. On the provincial level (a spatial scale comparable to Russian oblast or US state), the Ellison-Glaeser index for an average 2-digit Chinese industry increased from 0.0169 in 1996 to 0.0370 in 2005 (see Table 5 in (Lu, 2010) and Table 2a in (Lu and Tao, 2009)) – both figures are higher than for 1988 Russia.[6]

3. Russian urban system

This section discusses size, location, and functions of Russian cities. We start with the historical account of how urban system in Russia emerged, and how through the centuries state policies affected its development. We then turn to the main features of Russian cities and the spatial distribution of urban population today.

Urbanization history

The first major overhaul of the urban system in the Russian Empire happened when in 1775 empress Catherine the Great gave the status of a city to 216 rural settlements for the purpose of creating new administrative centers ((Le Donne 1982) and (Le Donne 1983)). There was notable deficit of "real" cities – centers of industry and trade – on wide Russian spaces. Even the population centers that already had city status prior to the reform were often no more than large rural settlements, whose residents held agrarian occupations predominantly. However, centralized governance structure demanded administrative centers, and they had to be scattered over large territory. And so the number of cities had to increase, if only in name. The sizable growth of urban population and increased importance of cities did not come until late 19th century, together with rapid industrialization.

A second wave of rapid changes in the urban system in the Russian Empire came after the emancipation of peasants during industrialization of late 19th - early 20th centuries. With the rise of

[6] Unfortunately, direct comparisons of concentration indices for the particular 2-digit industries between China and Russia or the USA are not possible because of the differences in industrial classification.

domestic and international trade and railroad construction, cities attracted migrants *en masse*. Port cities and railroad nodes benefited greatly. Finally, a sizable number of small and medium cities emerged. (Hooson 1968) gives a thorough narrative of city growth in the Russian Empire and early years of the USSR. He points out the differences in city growth dynamics prior to and after the 1917 revolution. Textile cities: Ivanovo and Yaroslavl, were among the leaders of growth in the Russian Empire. In the early USSR their growth slowed down, while leadership shifted to the cities that specialized in heavy industry. This is not surprising, given sectoral priorities of the Soviet government. Similar change of fate happened to the port cities and those close to the western border, as economic priorities of the Soviet state turned toward autarky.

The next rapid wave of urbanization started in the Soviet Union with the catch-up growth after the period of urban depopulation in the times of the Civil war, and continued through Stalin's industrialization in the 1930s. Urban areas continued to grow steadily over the rest of the Soviet period.

Regional investment priorities that we discussed in section 3 determined the geographical pattern of city growth and decline during the Soviet era. Cities were primary recipients of industrial investment and, therefore, grew much faster in the favored regions. The isolationist position of the USSR rendered advantages of international ports useless. Odessa used to be the 3rd largest city in the Russian Empire[7] and a leading seaport. In the late USSR it dropped to the 18th position. Saint-Petersburg lost importance with the collapse of international trade and the transfer of capital to Moscow. In contrast, among the largest cities the leaders of urban growth were located inland, mostly in the eastern parts of the country: Novosibirsk, Ekaterinburg, Omsk, Chelyabinsk. The destruction of WWII hit the western cities hard, but from the example of Japan (Davis and Weinstein 2002) we know that in the market environment even such drastic shocks to urban population tend to reverse in the long-run. This reversion did not happen in the USSR because of Soviet regional priorities.

Soviet period saw a number of cases of "entry" into the urban system or explosive growth of small settlements that happened when cities were created practically from scratch for the purpose of

[7] Not counting Warsaw, since Poland received independence from Russia in 1918 and did not return to the jurisdiction of the USSR.

particular industrial projects. The best-known examples are Komsomolsk-na-Amure and Magnitogorsk. The fastest growing cities in the USSR were, essentially, the places to house the workers for major projects in the strategically important industries. A number of them are located very far from other population centers and in very inhospitable climates. The most striking example is Norilsk, a city north of the Arctic Circle in the middle of Siberian tundra, with population of more than 200 thousand in the late Soviet years.

The notion of an "ideal" city size in Soviet central planning was another factor that affected development of urban settlements through the Soviet history. The "ideal size" varied between approximately 50 to 400 thousand residents, although it was never directly postulated as a planning goal. There is, however, plenty of evidence of ideological bias toward smaller cities, as well as general policy to restrict the growth of metropolises and to favor equal distribution of urbanization among regions as a part of overall doctrine of equal regional development. (Lewis and Rowland 1979) describe in detail the policies aimed at curbing large city growth and cite various Soviet and western sources on the directives to increase investment into small (below 50 thousand), medium (50 to 100 thousand) and new cities. (Rogers 1974) points out that in the 1960s the bulk of planned investment went to the towns of below 250 thousand people.

(Gang and Stuart 1999) list the residential restrictions that were imposed onto the large cities in the USSR and find that these restrictions were only marginally effective in reducing the rate of city growth as compared to a similar city with no such restrictions. We do not, however, know the counterfactual: it is possible that those large cities were inherently more attractive and would have grown faster than the average in the absence of restrictions.

With all the effort to restrict the growth of large cities and to favor medium ones, did the Soviet planners manage to make the city size distribution more uniform? (Clayton and Richardson 1989) describe Soviet attitudes and policies toward city location and size, analyze the city-size distribution, and come to the conclusion that it is overly equal, i.e. there is too little variation in city sizes. (Iyer 2003) similarly analyzes the changes in city-size distribution in Russian Federation during the last Soviet years and in transition. She finds increasing variation in Russian city sizes once market forces are allowed to operate.

Size and location of Russian cities

What are the main distinct features of Russian urban system today? (Hill and Gaddy 2003) discuss extensively how Russian cities do not fit a common empirical regularity: the Zipf's law. City-size distribution fits the Zipf's law if a relationship between the log of city rank (rank is 1 for Moscow, 2 for St. Petersburg, etc) and the log of city population size is approximately linear with the slope of minus one. This relationship holds for a majority of countries (see (Rosen and Resnik 1980)).

Russia does not fit the Zipf's law in the range of cities ranked roughly third to eighth: by the law the third-largest city has to have about 3-3.5 million residents (1/3 of Moscow's population), fourth largest - 2 million, etc. In Russia the 3d, 4th and 5th position in the city list are now taken by Novosibirsk, Ekaterinburg, and Nizhnii Novgorod, all of the population size below 1.5 million. The class of cities of the size between 1.5 and 3.5 million is missing from Russia's map. This has happened presumably because in post-Soviet Russia we are "missing" the group of leading Soviet cities - the capitals of Union republics: Kiev (the capital of Ukraine, pop. 2.6 million people), Tashkent (the capital of Uzbekistan, pop. 2 million), Baku (the capital of Azerbaijan, pop. 2 million).

Of course, the Zipf's law is not indicative of economic efficiency in the distribution of population across space. To this day, there is no theory that could derive the rank-size rule from the microeconomic foundations. Failure of the Zipf's law to hold merely indicates that Russia has fewer leading cities than other countries at a similar level of economic development.

From the cross-section of countries (Henderson 2000) estimated how urban primacy, i.e. the share of urban population in the largest metropolitan area, is connected to the economic growth. His results suggest that for countries like Russia (urban population at around 100 million and GDP per capita at around $8000) the highest growth rates occur when urban primacy is around 20%. The share of Moscow agglomeration, by most generous estimates, is below 15%. In other words, Russian urban population is too spread out.

Sparsity of population is even more pronounced when we consider the shares of several large cities, not just the biggest one. Table 4 gives several statistics of urban systems in countries with large territory and/or population, and with GDP per capita equal or higher that Russia's. We should

expect, that *ceteris paribus* a country with larger population would have smaller degree of urban primacy, share of largest cities in total population, and would require more cities to host the same share of population. On the other hand, population in countries with large territories and harsh climatic conditions tends to be more concentrated. Compared to Brazil or Mexico Russia's population is too dispersed by practically every measure. The comparison with Australia or Canada is even starker. Russia's urban population is practically as dispersed as the USA's, even though it is 2.5 times smaller.

Country	Urban pop $\times 10^6$	Land area, $\times 10^3$ km	% urban	Urban primacy	Share of urban pop. in 5 largest cities	50% of urban residents live in	25% of urban residents live in
USA	253	9629	82	0.07	0.21	25 cities	7 cities
Brazil	157	8514	86	0.13	0.29	20 cities	4 cities
Mexico	86	1964	77	0.23	0.39	13 cities	2 cities
Canada	26	9,984	80	0.20	0.50	6 cities	2 cities
Australia	20	7,692	89	0.23	0.68	3 cities	2 cities
Russia	94	17098	73	0.14	0.25	29 cities	6 cities

Population statistics are for metropolitan areas, last available census of population. For Russia smaller population centers within 50 km radius of large city were included into its metropolitan area; data for 2002.

Table 4: Urban population statistics for selected countries.

Russia has too few metropolises, its second-tier cities are too small, and there are too many small and medium cities inherited from imperial and Soviet past. Fewer people live relatively close to the major agglomerations than in comparable countries. Essentially, we are now faced with the same problem that Catherine the Great saw in the 18th century: a majority of 1044 Russian cities are not truly cities. They are too small and too isolated to generate agglomeration benefits, and in essence, are rural centers. Contemporary measures of urbanization in Russia are somewhat misleading. Many people are formally defined as urban residents. But formal definition of an urban settlement has nothing to do with economic benefits that we usually associate with cities – agglomeration effects, i.e. advantages of being located close to many other economic agents.

A separate set of problems that came into the light during the global financial crisis of 2008-2009 concern the "mono-cities" in Russia. The term refers to the cities and towns with a dominant employer. Many of such cities suffered severely due to the downturn in their dominant industry. Unfortunately, the academic research into the mono-cities in Russia is quite scarce. (Zubarevich, 2010) presents the most complete description of the Russian mono-cities, their problems and political issues to date.

In (WDR 2009) an agglomeration index was calculated. It is equal to the share of population that lives within 60 minutes of travel time to the major population center or in a city of at least 50 thousand people and at least as dense as 150 people per square km. This index is a measure of urbanization that is comparable across countries and independent from the official settlement status, criteria for which may differ across countries. For Russia, this index is only about 65%, below official urbanization rate (73%), and way below the average for OECD countries (around 78%). Moreover, World Bank criteria of an urban area are rather generous. (Zubarevich 2003), (Nefedova, Treyvish and Pallot 2010) noted that only Russian cities and towns of population roughly above 250 thousand people fare relatively well in modern economic conditions and have potential to work as vehicles of modernization. For smaller cities the benefits of agglomeration are weak to none. Yet the share of Russian population that lives in or around cities of 250 thousand inhabitants is below 50%. As of today, Russia is still under-urbanized and under-concentrated. With further economic development, the share of population in the major agglomerations will likely be increasing.

4. Post-Soviet migration and changes in regional inequality

After the breakup of the Soviet Union and with the start of economic transition the incentives of agents changed drastically. Massive Soviet subsidies to the lagging and remote areas stopped. Soviet restrictions to population migration were gradually eliminated through the 1990s. Enterprises had to restructure and learn to survive in market environment. Labor and capital faced new incentives engendered by the market environment and responded to them with migration. In this section we talk about how the spatial economy of Russia changed during the transition years.

Post-Soviet migration

One of the drastic changes of transition was complete reversal of the direction of population migration flows. The drastic reduction of subsidies to the northern regions and the currency crisis in the beginning of the 1990s resulted in a massive outflow of people from remote areas. Essentially, the people who were attracted by the Soviet economic incentives in the North, returned to the "mainland" once the system collapsed. (Heleniak 1999) estimates that through the 1990s about 8% of population of "The Far North" (which includes northern parts of European Russia, Siberia, the Far East, and Sakhalin, but does not include southern Siberia or Far Eastern south) left for the other regions. However, their preferred destinations were not in the warmer western parts of Russia, but in southern Siberia and Maritime province. By the end of the 1990s migration outflow from the Far North has decreased significantly. Overall, out-migration from the Far North during the transition years was marginal compared to in-migration of the Soviet years. It is fair to say that there is no trend to reverse the Soviet distortions estimated by (Mikhailova, 2004), or at least this will not happen in a foreseeable future.

(Andrienko and Guriev 2004) investigated pairwise migration flows between all Russian regions and found that migration does follow market incentives: people go to the regions that offer higher incomes and better quality of life, however the intensity of migration is low. Moreover, they found that for the poorest regions differential economic incentives do not produce a significant migration outflow. They proposed a hypothesis of poverty trap: people in the poorest regions simply lack the resources to finance the move. However, today, after a decade of growing incomes, we still do not see an increase in interregional mobility.[8]

The 2002 Census data show that population flows into large cities, leaving small settlements, but the size of these inflows are modest. Among the agglomerations, only Moscow experiences significant and robust migration inflow. Geographical distribution of population is changing. But low population mobility implies that the change is very slow. To this day, the spatial economy of Russia is still very "Soviet".

[8]There is an important caveat regarding the studies of migration in Russia. Since 2005, when temporary residential registration requirements for Russian citizens were eased substantially, many interregional migrants do not register, and hence do not appear in the data other than in once-a-decade population censuses. There is no quality data on temporary labor migration inside Russia at all, and permanent migrants sometimes show up in the data only years after the move, when they officially change permanent residence.

Regional inequality

Issues of regional inequality are of interest primarily from the practical policymaking point of view. During Soviet era, the equalization of regional development levels was postulated as a goal in itself and on ideological grounds. Theoretical models of economic geography (see, for example (Ottaviano et al. 2002)) typically predict an inverse u-shaped relationship between regional inequality and the size of transportation costs (which in historical context proxies for economic development). Thus, economic growth may be associated with either decreasing or increasing inequality, and it is not possible to make a definitive normative statement about the desirable level of inequality. On the other hand, regional inequality contributes to the inequality among people in incomes and standard of living, and thus it is a pressing social issue. In modern Russia, interregional budgetary transfers are one of the factors that are used to smooth interregional income inequality, but the thorough discussion of Russian fiscal federalism is beyond the scope of this chapter. Here we restrict ourselves to the review of the literature documenting and measuring regional inequality

After the decades of Soviet equalizing policies, the early years of transition to market economy brought about a sharp increase in inequality among Russian regions. Inequality has not decreased since. This is true whether one considers σ-convergence or β-convergence, and true not only for income per capita, but generally for the majority of economic indicators.

Regions experience σ-convergence if a chosen aggregate measure of inequality (Gini coefficient, standard deviation, etc) declines over time. Tests for β-convergence involve estimating a growth regression such as:

$$g_{it} = \alpha + \beta y_{i,t-1} + \gamma x_{it} + \varepsilon_{it},$$

where g_{it} - growth rate of region i in period t, $y_{i,t-1}$ - prior income level and x_{it} is a vector of controls added when investigating conditional convergence. Negative estimated value of β parameter points to regional convergence. It implies that rich regions grow slower, poor regions catch up. Positive value of β implies divergence.

(Carluer 2005) gives a general picture of how variance of regional income per capita had been changing over the years. In the late Soviet period (1985-1990) the gap between the lagging and leading regions did not change significantly, no convergence could be observed. A transitional

shock of 1991-1992 increased regional inequality sharply, and it stayed roughly the same until 1999. The same pattern persisted into the 2000s. (Lugovoi et al. 2007) looked at various measures of inequality in regional income levels (standard deviation, Gini coefficient, range, interquartile range) over 1996-2004 and found that neither of the measures has a robust tendency to decline, thereby pointing to the absence of σ-convergence. A subsample that excludes most prominent outliers: Ingushetia and Chukotka, shows weak but still statistically insignificant σ-convergence during 1999-2004. (Kholodilin et al. 2009) come to the same conclusion analyzing 1998- 2006 data: σ-convergence is very weak, if exists at all.

Studies of β-convergence paint the same picture. (Carluer 2005) finds weak β-convergence in 1985-1991, and 1992-1999, and divergence in 1991-1992, but none of the estimated coefficients is statistically significant. (Lugovoi et al. 2007) also found that unconditional β-convergence is absent. Conditional convergence (with a half-convergence period of 24 years) is present. However, some of the characteristics, which authors condition on, depend themselves on regional growth perspectives: financial aid, status of depressed region.

(Carluer 2005) identifies regional “clubs” by income and investigates transitional dynamics between the clubs. Two relatively stable and sizable groups are a leading club, which consists primarily of large metropolises and resource-rich regions, and a lagging club, which includes many ethnic republics and agricultural regions. A majority of the richest and poorest regions did not change their relative position during the transition years. Two intermediate clubs are very unstable, in fact, most of middle-income regions became relatively poorer from 1985 to 1999. Thus, the dynamics of regional incomes in Russia in terms of relative position was polarizing at that time: regions either (in rare cases) join the leader group or fall behind. Yet the absolute changes in regional incomes were not large enough to generate a significant change in the aggregate measures of inequality.

Drivers of regional growth and investment

What are the factors that drive regional growth in the Russian case? For 1996-2004 (Lugovoi et al. 2007) name region's specialization in fossil fuels (through both the direct effect of growth in that industry and through income spillovers during the period of high oil prices), favorable location and good transport infrastructure, and neighbor effects. Regions benefit from having fast-growing

neighbors. (Kholodilin et al. 2009) also find positive spillover effects from the rich regions to their neighbors. In the small circle of relatively rich regions located near each other convergence could be observed. Interestingly, (Carluer 2005) finds the opposite for somewhat earlier data range (1985-1999): metropolises and regional centers do relatively well in transition, but regions in the vicinity of them suffer more than those far away. He calls this "a vampire effect" of capitals. During the early years of transition, centripetal forces were dominating: metropolises were winning the competition for scarce investments, therefore economic activity concentrated in agglomerations. Later, centrifugal forces strengthened, and positive spatial spillovers started to work.

Another relevant strand of literature examines the changes to industrial structure, investment, and production reallocation in Russia during transition. (Rytchkov and Shevyakhova 2004) start with a formal model to derive a composite variable they call NEGF (new economic geography factor), which is a linear approximation of the theory-based measure of market potential. They found that NEGF has predictive power for the changes in Russian regional industrial structure during 1985-1999. Firms change location and follow market potential.

(Brown et al. 2008) analyze how entry of new firms depends on market potential. For a given location (*raion*) they construct a weighted average of the size of the markets (proxied by population) that can be reached from it. This measure of market potential is a function of geographical location (in relation to the other locales) and of existing transportation infrastructure. They found that new firms overwhelmingly favor regions with good market access. Moreover, as the authors show, in Russia the measure of market potential is strongly correlated with a number of inherent geographical characteristics such as January temperature, permafrost prevalence, distance to port, distance to the capital, etc. Even if firms are primarily driven by the agglomeration factors such as desire to be near other economic agents (consumers, suppliers), as the result, they locate in the regions with favorable location fundamentals.

The general conclusion is quite pessimistic with regard to lagging regions. In Russia today successful development of a region is mainly a function of geographical location. Two factors of geography define economic prospects. First factor is natural resource endowment – the lucky few regions that have lucrative natural resource deposits are richer. Second factor is market potential: how easily accessible from the region are main population centers, ports, transportation nodes. First factor is predetermined by nature. Second factor can be influenced by people through improvements

in transportation infrastructure. It is possible to improve accessibility of depressed regions, but as (Brown et al. 2008) calculate, such policy is not optimal from the point of view of Russia as a whole. The improvements in infrastructure would bring the largest benefit in the regions where economic activity is already concentrated.

5. Conclusion

Spatial structure of the economy is slow to change, especially in Russia, where, as we know from the evidence of the last 20 years, mobility of population is still rather limited. This means that in order to understand Russian spatial economy, we have to understand its evolution in historical perspective.

The biggest factor that explains the allocation of economic activity in Russia today is the legacy of the Soviet system. With respect to this legacy, we know a lot about how and when the productive factors were reallocated across the territory. What we know less about is why the Soviet authorities made these choices, what distortions had occurred as a result, and what their long-run consequences are. The great experiment of the Soviet central planning, and in particular its spatial aspects, is definitely an intriguing topic for research.

While there exist extensive literature on industrial location in many countries: United States, countries of the European Union, China, Japan to name a few, there is little yet known on modern Russia. What is the extent of the spillovers in various industries? What factors determine location and co-location of industries? What are the characteristics of locational dynamics of various industries in transition and after it? These are just a few of the open questions researchers might turn to.

Another set of questions has to do with regional policy. One of the features of Russia's spatial economy is its sparsity. There are too few people spread over too much territory. As a part of the global trend, and as a reversal of the Soviet misallocations, we should expect further concentration of economic activity in favorably located agglomerations in Russia. But this means that some territories would be losing population and stagnating.

(Dienes 2002) describes what he calls "Archipelago Russia": the striking contrasts that exist between integrated and vibrant cites on one hand and underdeveloped "dead space" or *glubinka* in between. Yet these contrasts are likely to deepen even more in the future. Russia now faces a typical problem of a diverse country, where leading regions significantly outpace lagging areas in terms of gross product and quality of life. The problem of inequality in Russia and the social problems that ensue, have a regional aspect. The most important determinant of a person's economic prospects in Russia is a place of residence. Coupled with low interregional mobility, this presents a growing problem: how to effectively help people in the lagging regions without subsidizing an inefficient spatial allocation of productive resources? One of the obvious measures is to encourage migration, to reduce institutional and economic barriers to population mobility.

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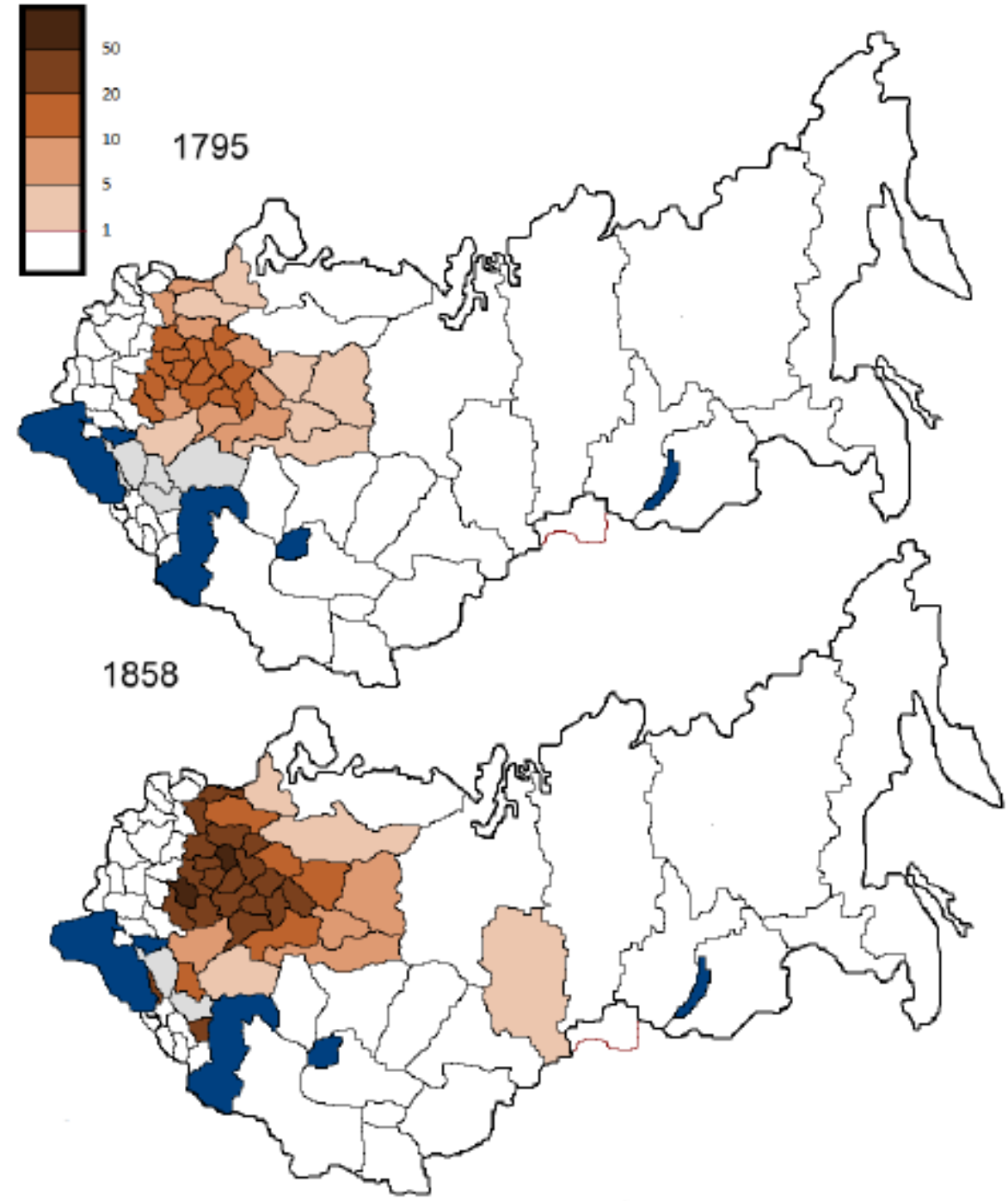
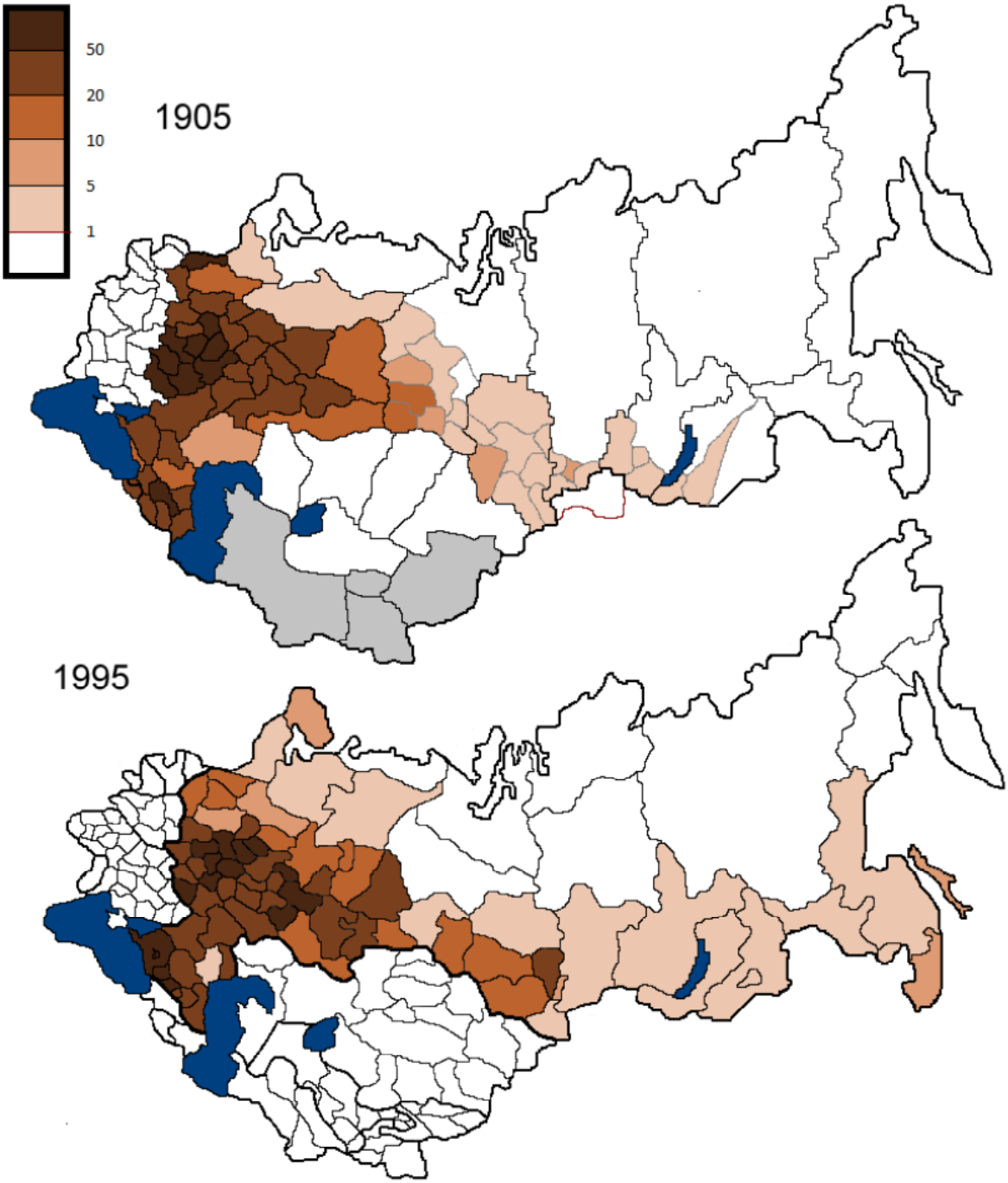
A. Tables and figures



Regions of the Russian Empire and the Soviet Union that now belong to Russian Federation are shown.

Figure 3: Population density in Russian empire, selected provinces.



Regions of the Russian Empire and the Soviet Union that now belong to Russian Federation are shown.

Figure 4: Population density in Russian Empire (selected provinces) and Russian Federation.

Region, oblast, or republic	1928 to 1913	1940 to 1928	1950 to 1940	1959 to 1950	1970 to 1959	1975 to 1970	1985 to 1980	1989 to 1985
North								
Vologda	1.60	3.19	1.43	4.31	1.51	1.35	1.22	1.08
Arkhangelsk	1.80	4.50	1.85	4.81	1.20	1.33	1.18	1.14
Komi	1.70	7.65	3.62	8.38	1.46	1.44	1.14	1.06
North-West								
Leningrad oblast	1.80	4.50	1.09	3.33	1.65	1.54	1.21	1.11
St. Petersburg city	1.40	8.57	1.33	3.42	1.42	1.33	1.13	1.13
Novgorod	1.00	4.20	0.71	2.10	1.75	1.55	1.28	1.22
Pskov	0.70	8.29	0.71	2.93	1.66	1.38	1.25	1.22
Kaliningrad							1.20	1.13
Murmansk	1.70	28.82	1.45	4.61	1.47	1.34	1.22	1.13
Karelia republic	1.90	4.68	1.24	4.04	1.26	1.25	1.30	1.17
Center and South								
Moscow oblast	1.60	6.19	1.41	3.94	1.44	1.39	1.13	1.13
Moscow city	2.20	9.55	1.62	3.81	1.49	1.36	1.12	1.17
Smolensk	1.10	5.45	0.53	1.83	1.70	1.43	1.31	1.21
Velikie Luki	1.30	4.38	0.96			restructured		
Tver	1.30	4.31	1.20	4.11	1.38	1.26	1.12	1.15
Yaroslavl	1.50	9.33	1.43	3.29	1.46	1.30	1.12	1.09
Ivanovo	1.30	2.31	1.27	2.33	1.47	1.20	1.09	1.10
Kostroma	1.20	3.33	1.73	3.75	1.41	1.33	1.17	1.10
Vladimir	1.60	3.56	1.75	4.74	1.45	1.37	1.23	1.14
Ryazan	1.50	5.53	1.33	4.70	1.54	1.53	1.20	1.14
Tula	1.00	19.00	1.37	3.37	1.72	1.42	1.19	1.11
Kaluga	1.30	4.62	1.27	4.33	1.68	1.44	1.32	1.25
Bryansk	1.70	5.00	0.92	3.18	1.98	1.46	1.15	1.13
Orel	0.90	12.22	0.61	3.00	1.85	1.70	1.32	1.24
Kursk	1.40	3.43	1.40	6.04	1.48	1.44	1.26	1.17
Belgorod	2.10	3.71	0.96	3.97	1.38	1.60	1.27	1.30
Voronezh	1.90	14.74	0.93	3.75	1.48	1.45	1.28	1.16
Lipetsk	1.20	7.92	1.47	6.00	1.64	1.51	1.28	1.17
Tambov	1.10	7.18	1.39	4.18	1.53	1.40	1.18	1.17
Penza	0.70	10.86	1.58	5.53	1.68	1.52	1.20	1.21
Balashov	1.90	5.11	1.13			restructured		
Volga								
Arzamas	2.00	4.75	1.89			restructured		
Nizhnii Novgorod	2.20	10.45	2.09	5.22	1.60	1.42	1.19	1.12
Kirov	1.80	6.11	3.45	10.55	1.37	1.35	1.18	1.12
Mordovia republic	1.40	6.79	1.26	3.68	1.94	1.61	1.31	1.23
Mari El republic	1.70	4.35	3.24	10.00	1.45	1.62	1.45	1.33
Chuvashia republic	1.10	8.64	2.74	8.84	1.47	1.69	1.45	1.24
Tatarstan	1.20	10.00	3.75	12.25	1.57	1.49	1.20	1.14
Ulianovsk	0.80	4.25	2.65	7.06	1.88	1.49	1.24	1.22

Current names were used for renamed regions. Sources: Statistical yearbooks "Narodnoe Khozyaistvo RSFSR" for 1956, 1961, 1962, 1965, 1969, 1975, 1981, 1987, 1990.

Table 5: Indices of industrial production in regions of RSFSR.

Region, oblast, or republic	1928 to 1913	1940 to 1928	1950 to 1940	1959 to 1950	1970 to 1959	1975 to 1970	1985 to 1980	1989 to 1985
Volga, continued								
Samara	1.30	10.77	4.14	15.00	1.69	1.72	1.14	1.10
Saratov	1.60	5.56	2.47	7.42	1.58	1.46	1.24	1.19
Volgograd	1.70	12.35	1.29	4.14	0.33	1.39	1.17	1.11
Kalmykiya republic	N/D	N/D	0.43	2.00	1.69	1.46	1.50	1.28
Astrakhan	0.70	3.71	1.38	2.42	1.43	1.43	1.18	1.16
North Caucasus								
Rostov	1.70	7.65	1.15	3.54	1.63	1.35	1.16	1.12
Kamensk	1.40	5.86	1.83			restructured		
Krasnodar krai	1.60	8.13	1.00	3.00	1.48	1.24	1.15	1.14
Stavropol krai	2.20	7.73	1.00	3.47	1.53	1.45	1.23	1.22
Kabardino-Balkaria republic	3.70	41.08	1.55	4.43	1.81	1.59	1.29	1.19
North Ossetia republic	1.90	13.68	1.04	3.00	1.72	1.42	1.26	1.22
Chechen-Ingush republic	3.90	2.82	1.36	2.91	1.71	1.07	0.99	1.07
Dagestan republic	1.60	6.88	1.36	3.45	1.80	1.38	1.28	1.17
Urals								
Udmurtia republic	2.00	10.50	2.29	7.24	1.85	1.68	1.25	1.15
Perm	1.50	10.00	2.07	4.80	1.61	1.37	1.19	1.14
Sverdlovsk	1.20	9.17	3.36	8.00	1.50	1.34	1.14	1.10
Chelyabinsk	1.60	15.00	3.29	8.04	1.49	1.33	1.14	1.10
Bashkortarstan republic	1.50	6.67	4.10	16.40	1.38	1.53	1.16	1.07
Orenburg	1.30	6.69	3.22	8.97	1.55	1.56	1.14	1.08
Western Siberia								
Kurgan	1.90	6.84	2.08	7.00	1.51	1.50	1.26	1.16
Tyumen	1.70	6.47	2.45	6.64	1.96	2.38	1.38	1.23
Omsk	2.50	10.40	4.35	13.92	1.54	1.53	1.19	1.11
Tomsk	2.30	6.09	3.36	10.29	1.31	1.36	1.36	1.21
Novosibirsk	2.30	16.96	4.05	13.31	1.51	1.55	1.21	1.15
Kemerovo	2.80	22.50	3.25	7.00	1.39	1.32	1.08	1.12
Altay krai	3.70	9.19	2.97	8.44	1.37	1.43	1.22	1.12
Eastern Siberia								
Krasnoyarsk krai	1.90	11.05	2.86	8.81	1.59	1.51	1.20	1.15
Tyva republic							1.17	1.25
Irkutsk	1.10	10.00	2.00	6.64	1.50	1.50	1.20	1.14
Buryatia republic	1.40	14.29	1.45	3.15	1.65	1.49	1.12	1.22
Chita	1.20	11.67	1.14	2.29	1.41	1.45	1.06	1.14
Yakutia republic	1.10	9.09	2.80	5.30	1.85	1.50	1.29	1.19
Far East								
Khabarovsk	1.10	24.55	2.00	5.19	1.52	1.47	1.19	1.17
Magadan	1.00	54.00	1.00	1.28	1.76	1.16	1.06	1.04
Amur oblast	1.90	5.26	1.40	3.30	1.39	1.28	1.09	1.11
Kamchatka	0.20	44.50	1.57	3.26	1.92	1.43	1.46	1.12
Primorskii krai	1.40	7.86	1.45	4.00	1.47	1.42	1.23	1.17
Sakhalin	2.60	44.23	6.37	N/D	N/D	N/D	1.14	1.09

Current names were used for renamed regions. Sources: Statistical yearbooks "Narodnoe Khozyaistvo RSFSR" for 1956, 1961, 1962, 1965, 1969, 1975, 1981, 1987, 1990.

Table 6: Indices of industrial production in regions of RSFSR, continued.